

REMARKS

Summary of the Examiner's Actions

The examiner rejected 1 and 4 under 35 U.S.C. § 102(b) as being anticipated by Horbaschek et al., U.S. Patent 4,937,848 ("the '848 patent"). Applicant acknowledges the rejection under 35 U.S.C. § 102(b). The examiner objected to Claims 2, 3 and 5-10 as being dependent upon a rejected base claim and indicated that Claims 2, 3 and 5-10 would be allowable if rewritten in independent form include all of the limitations of the base claim and any intervening claims. Applicant appreciates such indication.

Rejections under 35 U.S.C. § 102(b)

Section 2131 of the Manual of Patent Examining Procedure describes the basis for anticipation under 35 U.S.C. § 102. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim. *In re Bond*, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990).

The Examiner stated that the '848 patent "discloses a first digital pipeline latch for receiving said data collected by a positron emission tomograph device." The Examiner continued that the '848 patent "discloses position data is outputted from X-ray tube 1" and that "X-ray tube 1 corresponds to the claimed 'positron emission tomograph device'." It is respectfully submitted that one skilled in the art will recognize that an X-ray tube does not correspond to a PET tomograph.

The Examiner also indicated that "all process steps above are done within computer 11, therefore, the transformation from the primary coordinate system to the secondary coordinate system is done in real time." Again, Applicant respectfully disagrees with the conclusion that because the process steps are performed within the computer that they are necessarily performed in real time. At the time of the '848 invention, and even still today, the performance of any calculation on data as it is

collected, or in "real time," is difficult due to the volume of data collected and the hardware requirements for accomplishing such processing. It is more common for batch processing to be employed to accomplish this task. More specifically, the raw data is typically stored and processed at a time when the computer is not being used to collect data.

While the '848 patent teaches the use of digital pipeline latches and parallel multipliers to correct for the well-ordered 2-D and 3-D motion of the X-ray tube relative to the stationary or slow-moving patient couch, such motion is by nature regular and repetitive. This is proven from the use of the horizontal and vertical "sawtooth" voltage generators 18 and 19, respectively.

In contrast, the present invention is used to correct for random 3-D and 6-D motion of the patient relative to the stationary or predictably rotating PET detector array. The motion of the patient is unpredictable, as it is due to normal patient physiology such as coughing, sneezing, relaxing, and nervous disorders. It is also impossible to predict the precise 3-D angle of each gamma pair emitting from the patient.

In the '848 patent, the X-ray tube and X-ray beam are moved relative to the patient. The apparatus and method employed are to correct the single-beam projection data in mass. The single beam is only in one position at a time. While the beam is in this one position, the apparatus is collecting many hundreds of thousands of X-ray photons. The correction apparatus may only correct for the single X-ray beam in any particular orientation, while the sawtooth waveforms are at a particular phase.

In contrast, due to the nature of PET, the present invention is provided to correct from 100 million to 1 billion gamma pair lines-of-response (LORs) which are emitted from the patient at many random angles and orientations relative to the PET detector array. Because PET in its emission of the gamma pair LORs at many angles for each position is significantly different from X-ray tube techniques used for transmission of beams at a particular angle for each position, the demands of the present invention are profoundly more complex and demanding for rapid response.

The '848 device detects beams within a 2-D assembly including an X-ray image intensifier and a video camera. This assembly is placed on one side of the patient as illustrated. In the present invention, however, the gamma pair LORs are detected with a 3-D array of gamma detectors. This array is typically organized in a cylindrical configuration at least partially surrounding the patient.

From the distinctions between the two arts (X-ray v. PET tomography), it is respectfully submitted that those skilled in the art recognize that the '848 patent does not anticipate the claims of the present invention. Specifically, the '848 patent does not teach a device for on-line correction of patient motion. Further, the '848 patent does not teach such a system for use in 3-D PET. Nor does the '848 patent teach such a device wherein a PET tomograph device is used to collect coincidence event and position data. Because of these and other distinctions, it is respectfully requested that the Examiner's rejection of Claims 1 and 4 be reconsidered and withdrawn.

Claim Objections

Claims 2, 5 and 7 have been rewritten in independent form, including all of the limitations of the base claim and any intervening claims. Specifically, new Claim 11 includes all of the limitations of Claims 1 and 2, with Claim 2 being cancelled without prejudice. Claim 3 has been amended to depend from new Claim 11. New Claim 12 includes all of the limitations of Claims 4 and 5, with Claim 5 being cancelled without prejudice. Claim 6 has been amended to depend from new Claim 12. Finally, new Claim 13 includes all of the limitations of Claims 4 and 7, with Claim 7 being cancelled without prejudice. Claims 8 and 9 have been amended to depend from new Claim 13. Applicant respectfully submits that claims 3, 6 and 8-13 are in condition for allowance.


Summary

In view of the amendment of Claims 3, 6, 8 and 9, the re-presentation of Claims 2, 5 and 7 as new Claims 11-13, respectively, the cancellation of Claims 2, 5 and 7, without prejudice, and the arguments presented herein, it is believed that the above-identified patent application is in a condition for the issuance of a Notice of Allowance. Such action by the examiner is respectfully requested. If, however, the examiner is of

the opinion that any of the drawings or other portions of the application are still not allowable, it will be appreciated if the examiner will telephone the undersigned to expedite the prosecution of the application.

Please charge any additional fees associated with this communication, or credit any overpayment, to Deposit Account No. 16-1910.

Respectfully submitted,
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